DOCUMENT RESUME

ED 289 245 EA 019 780

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TITLE Foundations for a Post-Modern Curriculum.
PUB DATE Apr 87
NOTE 27p.; Paper presented at the Annual Meeting of the American Educational Research Association (Washington, DC, April 20-24, 1987).
PUB TYPE Viewpoints (120) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS *Curriculum; *Cybernetics; *Educational Philosophy; Elementary Secondary Education; *Foundations of Education; Holistic Approach; Humanization; *Physics; Relativity; Systems Approach; Thermodynamics
IDENTIFIERS Newton (Isaac); Postmodernism; *Prigogine (Ilya)

ABSTRACT

This paper suggests that present-day curriculum, based on Newtonian thought, has been rendered obsolete by the holistic and interactive "post-modern" world view based on quantum physics, nonlinear mathematics, general systems theory, and Ilya Prigogine's nonequilibrium thermodynamics. The Newtonian world view, which is linear and reductionist, is the theoretical foundation of Madeline Hunter's or Ralph Tyler's notions of an orderly curriculum with ends preset, and of B. F. Skinner's conceptions of expressing learning in discrete, quantifiable, and linear units. These conceptions assume the whole to be no more than the sum of the parts and lead to a curriculum that is cumulative rather than transformative. This paper accordingly focuses on three facets of post-modern thought that have radical implications for curriculum: (1) the nature of open (as opposed to closed) systems; (2) the structure of complexity (as opposed to simplicity); and (3) transformatory (as opposed to cumulative) change. Prigogine's notion of nonequilibrium or dissipative structures in the process of becoming is posited as a more accurate model for a curriculum than Newton's physical, inert, mechanical structures. These developing, open structures have their own properties, distinct from equilibrium structures, and are useful as models for curriculum research and thought. Specifically, it is argued that curricula should be structured as self-regulating "open systems" where internal, autocatalytic transformations are encouraged. To move from a curriculum based on the simple and separate to one based on the complex and cosmological requires us not only to adopt a "new dialogue with nature" but also to adopt a radically new relationship with students and a more integrative approach to subject matter. (TE)

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FOUNDATIONS FOR A POST-MODERN CURRICULUM

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A.E.R.A. - 1987
S.I.G. - Creation and
Utilization of Knowledge
Washington, D.C.

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92373-0999

> Where classical science used to emphasize permanence, we now find change and evolution; we no longer see in the skies the trajectories that filled Kant's heart with the same admiration as the moral law. We now see strange objects: quasars, pulsars, galaxies exploding and being torn apart, stars that, we are told, collapse into 'black holes' irreversibly devouring everything they manage to ensnare.
>
> Prigogine and Stengers,
> Order Out of Chaos,
> 1984, pgs. 214-215.

With this quote we see our vision of the universe turning from the simple, stable, eternal one of Newton to the complex, chaotic, finite one of David Bohm, Ilya Prigogine, Rupert Sheldrake and other post-moderns.

Ilya Prigogine, the 1977 Nobel Prize winner in Chemistry, and Isabelle Stengers, professor of philosophy at the University of Chicago, begin their book, Order Out of Chaos (1984) with the following statement:

> One of the greatest dates in the history of mankind is April 28, 1686. (p. 1)

This is hardly a date, just over 300 years ago, many of us remember from our school textbooks. Yet it is a prominent date in the history of western thought, and even plays an important, although often unrecognized role in the history of curriculum. April 28, 1686 is the day Issac Newton presented his Principia (The Natural Principles of Philosophy) to the Royal Society of London. Book III of this treatise, the one containing Newton's famous "universal law of gravitation," is entitled "The System of the World." This system has, since Newton's death, become a paradigm: a paradigm which we now see began with the observations and musings of Francis Bacon, Nicholas Copernicus, Galileo Galilei, and Tycho Brahe. This paradigm dominated western scientific and intellectual thought well into the present century, and continues today, as the foundational model for the social sciences, including education. As Christopher Lucas has expressed it:

> The abandonment of Newtonian mechanics as a paradigm for understanding reality is relatively well ad-

> vanced. Yet, the metaphysical view of the world it once inspired has proved rather more durable. Perhaps because of cultural lag, only in recent decades have the philosophical implications of quantum physics begun to reverberate through other knowledge domains. Overall, the new image of reality unfolded by modern science portends a radical revision of how the world and human consciousness itself is to be comprehended. (p. 165)

The modern scientific view Lucas mentions here is more commonly called a post- modern view, and to the degree this view represents a radical revision of the world and human consciousness so, too, does it have radical implications for education and curriculum.

It is not easy to define post- modern, even though the word has been hyped by popularizers and image makers. As Stephen Toulmin points out, the modern world is behind us, but the post-modern world is so recent that it "has not yet discovered how to define itself" (The Return to Cosmology, p. 254). In spite of this, a definition can be started. My friend Brent Waters says that post-modernviews "represent a critical reappraisal of modern modes of thought, religious belief and moral conviction." Such views invite "deepening suspicion of the rigid dichotomies modernity has created between objective reality and subjective experience, fact and imagination, secular and sacred, public and private" ("Ministry and the University in a Postmodern World," p. 113).

Prigogine and Stengers pick up this interactionist and holistic theme when they say that through post modern science we are "developing a new dialogue with nature," one wherein "our vision of nature is undergoing a radical change toward the multiple, the temporal, and the complex" (p. xxvii), and conversely, away from the universal, the stable, and the simple, which Newton's system posited.

The roots of this post modern view of the world are to be found, in part, in the quantum physics debates Albert Einstein, Niels Bohr, and Werner Heisenberg had in the 1920's. The systems approach of Ludwig von Bertalanffy also has been seminal, as has been the developmental biological work of C.H. Waddington and Jean Piaget. In philosophy, Alfred North Whitehead's Process and Reality (1929) is used as a foundational pillar. However, the person who has drawn on all of these, synthesized them, and added his own contribution is Ilya Prigogine with his From Being to Becoming (1980), and Order Out of Chaos (1984). In these and in his work with non-equilibrium thermodynamics Prigogine has drawn heavily on the fields of non-linear mathematics and physical chaos.

My argument is that Newtonian thought is one of the foundations on which the present day curriculum is based. Direct correlations can be made between Madeline Hunter's or Ralph Tyler's notions of an orderly curriculum with ends pre-set and Newton's idea of a stable universe with planets rotating around the sun in perfect harmony. Harmony is definitely a modern, not a post- modern, concept; but it is the ideal goal

of a Tyler-Hunter curriculum. Disturbance is not viewed here as a key, necessary, or desirable ingredient. Connections can also be made between B. F. Skinner's or James Popham's view of expressing learning in discrete, quantifiable, and linear units and Newton's approach to the calculus. Both are reductionist, assume the whole to be no more than the sum of the parts, and lead to a curriculum which is cumulative rather than transformative. This connection between curriculum and the Newtonian paradigm I have explored elsewhere in greater detail (Doll, 1986; Doll, n. p.).

In this paper I'd rather focus on three facets of post- modern thought--foundational assumptions, as it were-- which have radical implications for curriculum. These three are: (1) the nature of open (as opposed to closed) systems, (2) the structure of complexity (as opposed to simplicity), (3) transformatory (as opposed to accumulative) change. Before exploring these three facets I'd like to make a few comments about Ilya Prigogine and his role in post- modern thought.

Prigogine received the 1977 Nobel Prize in Chemistry for his work on dissipative or far-from-equilibrium thermodynamic structures. A far-from-equilibrium structure is one in the process of becoming, such as in a basin of water when the hot and cold are beginning to merge and blend. Structures of this sort characterize chemistry and biology. They become the very essence of living systems. They are not the physical,inert, mechanical structures Newton used in his Principia. Hence in his book, From Being to Becoming (1980), Prigogine is describing

chemical and biological structures, particularly those in the formative, developmental, emergent state. While the world is obviously made of both stable structures, which have settled into a state of equilibrium being, and unstable (or dissipative) structures, which are in a formative, and indeed chaotic, state of far-from-equilibrium becoming, Prigogine believes the latter to be more common than the former. I might add that the latter is a more beneficial model for curriculum to use as a foundation than the former -- albeit the model will be more messy and chaotic to develop and evaluate. In fact, the mathematics involved in far-from-equilibrium situations is the relatively recent complex and complicated mathematics of non-linear algebra. Prigogine has been outstanding in calling upon this mathematics as he has developed his theories, just as Newton was outstanding in calling upon the linear calculus he developed for his theories. As John Briggs and David Peat point out in their book, The Looking Glass Universe (1984), scientists have not had, until recently, the mathematical tools to deal with far-from-equilibrium situations, and so, as Waddington, in his Evolution of an Evolutionist (1975), charges, they have either ignored developmental aspects in their research or they have assumed far-from-equilibrium situations to be but variations on equilibrium situations. Not so,says Prigogine, echoing statements made previously by both Waddington and Piaget. Far-from-equilibrium (or developing) structures have their own indigenous pecularities-- and, I'd add, are useful as considerations for curriculum research and thought.

If the hot and cold water taps in the basin described earlier are shut-off, the two streams of water will mix gradually and reach an equilibrium state of being. Here there is gradual movement toward closure, and also toward stagnacy and the loss of heat producing energy (death by entropy). If, however, the taps are not shut-off there is the possibility of transformatory change: hot enough water will produce steam, cold enough water will move the basin towards the freezing point. Here the pattern is not one of gradual change, but of chaotic, turbulent, sudden change. Prigogine, speaking metaphorically, talks of combining red and blue molecules, in the manner of the hot and cold water taps. In an equilibrium, or near-to-equilibrium, situation one would see the red and blue molecules mixing to form a visual purple pattern or hue. But in far-from-equilibrium situations where boiling or freezing transformations are about to take place, the molecules change all at once: it is as if all the blue molecules became red without any intermediary purple step. The change is a quantum leap. Here Prigogine talks of self-organization and communication. "To change color all at once, molecules must have a way to 'communicate.' The system has to act as a whole" (Prigogine and Stengers, p. 148). This example is reminiscent of Waddington's "genetic landscape" where pathways (chreods) are formed in which a gene continues until a threshold is reached when a sudden and dramatic genetic change occurs. Piaget used this concept from Waddington for his theory of transitions from one intellectual stage to another. I have discussed Waddington's

and Piaget's views on this at length in my paper "Curriculum and Change: Piaget's Organismic Origins" (1983).

Heuristic as it is, almost nothing educationally has been done with this model of transformative change. Jerome Bruner, though, did write a fascinating and greatly overlooked article, "Perception of Incongruity: A Paradigm" (1949), where he outlines and hypothesizes on aspects of this transformatory model. One individual who did not overlook Bruner's article is Thomas Kuhn who, in chapter 6 of his book, The Structure of Scientific Revolutions (1962), cites the article as being influential to his own thinking about the complementarity of evolutionary and revolutionary change. Prigogne calls these far-from-equilibrium, transformative structures dissipative, because in their interaction with the environment they depend upon a certain amount of dissipation to occur for the self- organizing aspect of the structure to function. Indeed order does literally arise out of disorder or chaos. This leads to the three facets of dissipative structures I'd now like to explore.

Open vs. Closed systems. In thermodynamics it is common to classify heat-energy-matter exchange systems in terms of isolated, closed, open. Isolated systems are, as their name implies, removed from their environment, exchanging nothing with it. A perpetual motion machine is the ideal example for this. A closed system exchanges energy, but not matter, while an open system exchanges both energy and matter, and actually rejuvenates itself through this exchange. In a

broader sense a closed system is one that is tightly controlled, as in a steam engine, where the variables are few, the parameters pre-set, and the predictability high. This is how a steam engine achieves efficiency. It is also the model Hunter and Tyler assume when ends are pre-set, objectives are developed in line with those ends, and closure is a return to the ends and the objectives to see they have been carried out. With its feedback loop, this is a systems view of curriculum, but not a living, open systems view. Open systems literally "feed on flux," using flux as the substance for their continual becoming. "They (open systems) feed on the flux of matter and energy coming to them from the outside world." Biological "cells die when cut-off from their environment .... they cannot be separated from the fluxes that they incessantly transform" (Prigogine and Stengers, p. 127). The contrast here is between (1) a highly controlled (steam engine) system where external parameters shape interactions towards a pre-set end of efficiency, and (2) a fluctuating, (living cell) system where external perturbations provide the system with the very means for internal transformation. Here ends are literally integrated with means. John Dewey would be pleased.

Obviously these systems are dichotomous. A closed system, like Skinner's teacher-proof machines, wants to protect itself "from the fluxes that compose nature" (Prigogine and Stengers, p. 128). An open system, on the other hand, needs fluxes, perturbations, anomalies, errors: these are the triggers which set-off reorganization. As Piaget has said: "It is worthwhile to note that however the nonbalance arises, it pro-

duces the driving force of development" (The Development of Thought, p. 13). It is ironic that Piaget's open, living system model of development -- equilibrium disturbed by disequilibrium leading to re-equilibration -- was so easily converted into a closed system, age-stage correlation. However, considering the Newtonian background assumptions which have dominated American curriculum, it is not surprising.

The curriculum implications here seem obvious -- namely, curriculars should study open systems in both a metaphoric and literal sense. Metaphorically we should structure and study curriculum in such a manner that internal, autocatalytic transformations are encouraged to occur. Piaget called this process phenocopy. In our present closed system format this concept is absurd: autocatalytic, transformative structures do not appear as part of the literature, and the "noise" which produces them is quickly and quietly factored out. The result is this transformative process remains more mysterious and magical than it should. At the literal level, we should study open systems wherever they occur: in biology, in chemistry, in medicine. Again to quote Piaget, on the main thesis which has guided his work: "Life is essentially autoregulation" (Biology and Knowledge, p. 26). This, he says, is a trivial, even banal, thesis, but one too often overlooked. It is not a thesis which has guided curriculum modeling or practice.

The Simple (and Separate) vs. the Complex (and Cosmological)

Newton's universe was a simple universe. The mathematics is that of lines, trajectories, areas -- all simple, linear concepts. Newton

assumed the universe to be one large arithmetic grid with each set of coordinates proportionally consistent with every other set of coordinates. It was a view which posited harmony, order, uniformity. One of the revolutions which came from this era, the industrial revolution, was itself based on simple mechanics. As Daniel Bell points out (The Coming of Post Industrial Society, 1973), the mechanical inventions which made this revolution were done by "talented tinkerers" (p. 20), men of a practical and simple bent. However, beyond such a surface level there was what Edwin Burtt (The Metaphysical Foundations of Modern Science, 1927), calls "the postulate of simplicity" (p. 348). This principle states that Nature always works in the simpliest manner, or goes by the simpliest route: "Natura semper agit per vias brevissimas" (p. 26). It was this principle which influenced Copernicus in his theory of a sun-centered universe, and which dominated western thought from Plato to Einstein. Acceptance of this principle allowed Newton to posit his notion of an objective, God's-eye view of time where could be seen the past, the present, the future. In fact, the concept of objectivity we now have is based on the assumption of such a simple-ordered reality, one which allowed Laplace to state that "Newton was the luckiest of men who ever lived, for there is but one order to the universe and he has discovered it" (Burtt, p. 18). In its own way this statement of Laplace's captures well the curriculum activity of many fourth, fifth, sixth grade classrooms.

Prigogine challenges this concept of the simple with his own con-

cept of the complex. As he and Stengers say, in the first sentence of their Preface: "Our vision of nature is undergoing a radical change toward the multiple, the temporal, and the complex" (p. xxvii). Complexity became part of the scientific world in the early decades of this century when Einstein developed his theory of relativity and quantum physicists explored the strange world of the atom. Today complexity is a field of study in mathematics, in management, and in sociology. It is part of our daily lives. Prigogine argues that this emerging "new science of complexity" (p. 209) is more characteristic of reality than is simplicity, but that we've been trained in "terms of linear causality," and now need "new tools of thought." This applies very much to school teachers and the educational training they receive and the models of learning they are taught. Here the works of Howard Gardner (Frames of Mind, 1985), and Robert Sternberg (Beyond I.Q., 1985) are breaths of fresh air in a stale field. Stephen J. Gould's The Mismeasure of Man (1981) is a fine history of the human intelligence field with its strong connection to Newtonian assumptions.

Complexity assumes reality to be web-like with multiple interacting forces. We, as observers, are inside, not outside, the web. Thus, knower and known are interactively entwined. There is no God's-eye view here, and objectivity takes on a new subjective dimension. We are limited in our perceptions and evaluations by our own places in space and time: trapped as it were by our own historicity. This is why Prigogine makes time and "its arrow" such an important element in his

theory.

Further, with multiple interacting elements occurring in most situations it is difficult to predict the development of many situations, to know how a complex system will respond to a given change. In simple situations, those near equilibrium with few variables, easily described by linear mathematics, there is a uniform proportional relationship between cause and effect. Small perturbations cause small effects. Predictability is based on this stable relationship. In complex situations, however, this simple relationship does not hold. A small perturbation, acting among many intertwined elements, can have a multiplying, even exponential, effect. And some of these effects are of a transformative, qualitatively different, nature, as in atomic reactions.

It is too early to tell what the new "tools of thought" will be which are to help us understand how complex systems respond to given changes. Presently we are left with the frustration of the M.I.T. scientist who coined the word "counterintuitive" because "the damn thing does not do what it should do" (Prigogine and Stengers, p. 203). However, Prigogine does give examples of complex situations reaching thresholds of stability/instability and then spontaneously reorganizing themselves into newer and higher orders of complexity. This is akin to the model of human evolution Stephen Gould and his associates have been advancing under the title "punctuated evolution" (New Scientist, April 15, 1982). At the very least we can say that dissipative structures do not necessarily lead to entropy (gradual death by loss of heat and energy);

biological evolution is a dramatic and long-term counterpoint. Some structures, intellectual-biological-chemical, do reorganize and rejuvenate themselves on a higher plane or level or complexity.

Paralleling the dichotomy between the simple and the complex is that between the separate and the cosmological. As Toulmin points out in section III of his The Return to Cosmology (1982), modern, Newtonian science reacted strongly to the all-embracing cosmological views of the ancients, and substituted instead a separatist, and ultimately reductionist, methodology of partitions. Descartes is famous for his separation of all being into Body (Res extensa) or Mind (Res cognitans). Newton followed this trend, and so did the German curriculum makers of the 19th century. Thus today, in schools and colleges, we study "separate and distinct disciplines" (p. 228). This sense of specialization and separation is coming under increasing in a post-modern world, but the curriculum implications of a cosmological view have hardly been explored. One notable exception to this statement is Donald Oliver's forthcoming book, Education as Cosmology (1987 or 1988).

While the "astrocosmological" view of the ancients is not a goal we wish to readopt, Toulmin does argue for a new cosmological perspective: one which accepts the progress and triumphs of a scientific, reductionist methodology, but places this methodology within an interactive and holistic framework. What we see depends upon where we stand in the web of space and time. Specifically, Toulmin argues for recognizing, as Dewey did, that the knower and the known are intertwined. For realizing

that, a science without humanity, without values, purposes, beliefs is a false science: the false science of the spectator who always stays outside the arena of action, removed from the existential happenings of life -- the "pure" scientist as the phrase goes. This spectator view of science, of knowledge, of teaching is a thing of the past. But in curriculum its spectre still haunts us. Far too often our curriculum is reductionist, and far too this curriculum assumes the teacher to be a spectator in the arena of learning.

To move from a curriculum based on the simple and separate to one based on the complex and cosmological requires us not only to adopt a "new dialogue with nature" (to use Prigogine's phrase), but also to adopt a new relationship with our students: a radically new relationship. To paraphrase (and slightly alter) some fine lines from Donald Schon:

> In a reflective contract between teacher and student, the student does not agree to accept the teacher's authority, but to suspend disbelief in that authority. The student agrees to join the teacher in inquiry, in trying to understand what the student is experiencing, and to make that understanding accessible to both the student and the teacher.

> The teacher, on her part, agrees to help the student understand the meaning of the advice given and the rationale for it; to make herself readily confrontable by the student; and to reflect with the student on the tacit understandings each have. (The Reflective Practitioner, p. 296.)

From such a reflective relationship a transformative and post-modern curriculum can be born. Such a relationship will not be sufficient for transformation to occur, but it definitely will be a necessary factor.

Transformative vs. Incremental Change: By its nature, education, and the curriculum which guides it, is committed to change: directed, purposive, intentional change. Change, however, in a modern, closed system is categorically different from change in a post-modern, open system. In Newton's ideal universe, stability, not change, was the desired goal; change occurred rarely-- and then was the result of a flaw in the universe which God as *Deus ex machina* put right by direct intervention. This caused Leibniz to remark that Newton's God really was neither omniscient nor perfect, since He had to readjust His handiwork. In any event change in the Newtonian framework was looked upon negatively, not positively. While both entropy and evolution destroyed the "perfect harmony" of Newton's system, change was still handled in a

controlled, incremental way. Even in the Darwinian evolutionary thesis of "Nature red in tooth and claw" from unbridled competition, there exists an "invisible hand" guiding change toward a better future and higher species. Change still exists here, incrementally, within a system maintaining order if not closure.

This view of change has carried over to the 20th century which is one reason quantum physics, with its non-predictable leaps, seems so strange: it violates our normative expectations. In many ways B.F. Skinner represents the 20th century, modern view toward change: committed to it within certain well defined parameters, but fearful of it lest change break those parameters. The political repercussions here are immense, as both the Marxists and the fundamental conservatives have shown. In any event, change which is associated with chaos, complexity, confusion, and uncertainty is not a part of modernist thinking. Teaching machines and programmed learning control change in restrictive, incremental units, purposively designed to avoid error.

A post-modern view looks upon change in an entirely different light. Change is seen in transformative, not incremental, terms; and errors are seen as necessary actions in the process of development: the motors which drive development. Allied with this, of course, are theories of chaos, uncertainty, and confusion taking ever increasing roles in the fields of management, mathematics, political science, physics, and sociology. This is one reason why Prigogine's work on unstable structures has proven so popular.

Transformative change in an open system has a number of assumptions antithetical to a modernist view. It is these assumptions which make post-modern thought radically different from modern thought, even though certain curriculum practices may fit both systems. Three of these assumptions are those of internality, spontaneity, and indefiniteness. Each has curriculum implications, which, intertwined, produce, as Piaget realized, a change of quality not merely an increase in quantity. These changes are changes in states of being, and hence become, in Prigogine's terms, becomings. Transformative change is a change in view, in perspective, in methodology. It permanently alters one's relationship to nature, to life, to the environment, to learning. It is characterized by the sort of gestalt switches Piaget describes as the child or youth moves from stages of actions to those of representation, relations, systems (the pre-operational, the concrete operational, the logico-mathematical).

Internality, or internal reorganization, is a key assumption in transformative change. In a Newtonian, Darwinian, or Skinnerian modernist system, change is externally controlled or directed. Either God is directly intervening, or the environment is molding, or the teacher is shaping by reinforcement. All these actions are performed by an active force external to the recipient, who remains passive. This is the famous spectator theory of knowledge which Dewey, Piaget, and Toulmin reject so vociferously. Learning in this model occurs as the recipient receives that which is given or adapts to the external forces

the environment provides. With an internalist or constructivist set of assumptions, change is the result of internal reorganization triggered either by the organism itself or by the organism reacting to external forces. In either case, internal restructuring by an active organism or learner is key. A post-modern curriculum will accept the student's ability to organize, construct, structure, and will emphasize this ability as a focal point in the curriculum. The development of this organizational ability is as key to the post-modern curriculum as passive receptivity or shaping is to the modern curriculum.

Such organizational ability can be trained, as Bruner has argued in his " Discovery" essays (1961, and 1971). However, as Piaget has argued, and as Bruner has accepted, there is still a strong element of spontaneity in the transformative process. Internal reorganization is an interactive process, and while it definitely is influenced by external forces, it does not mirror those forces. In Piaget's terms it both assimilates and accommodates these forces. When a transformation occurs allowing new perspectives, there is a suddenness to the transformation. As Prigogine says "all the red molecules turn blue." A post-modern curriculum must allow time for this internal restructuring to take place, and must look for evidence of spontaneity about to occur. Development here, as Gould asserts, is via spurts not increments. Again, Bruner's work on the perception of incongruity is valuable here, and should be followed up with further research. While the conscious break-through to a new level of organization occurs suddenly and spontaneously, a long

period of subconscious preparation appears to be not only important but necessary. Our modern methods of teacher-student interactions will need drastic revisions to enhance this model of learning. For one thing, teachers will need to combine supportive behavior with challenging behavior -- equilibrium with disequilibrium -- and to give students time to organize their own thoughts. In regard to this latter point, Jim Dillon's work on questioning may prove to be a useful guide (Questioning and Teaching, 1987).

In a modernist perspective curriculum plans are to be well articulated, with ends clear and means precise. This is the key to the Tyler-Hunter model. In a post-modern curriculum there must be, as Dewey realized, a sense of indecision and indeterminacy to curriculum planning. The ends perceived are not so much ends as beginnings; they represent ends-in-view, or beacons, which act as guides before the curriculum implementation process begins. But once the course develops its own ethos these ends are themselves part of the transformation; they, too, along with the students, the teacher, the course material, undergo transformation. The locus of power and direction shifts from the external to the internality of the course experience. The ends more and more emerge from within the course in a conjoint fashion, the teacher more and more becomes *prima inter pares*, and the canons of inquiry and creativity more and more take over the direction and process of development. Here curriculum becomes a process of development rather than a body of knowledge to be covered or learned,

ends become beacons guiding this process, and the course itself transforms the indeterminate into the determinate.

In a post-modern curriculum, then, there is a sense of both cosmology and teleology: cosmology in terms of integral wholeness, teleology in terms of purposiveness. To this extent a post-modern curriculum is in opposition to a modern curriculum, with its separate parts, and is a throwback to the pre-modern curriculum of the Christians and the classicists. However, there is a key difference here. The pre-modern world view was externally oriented, either towards Plato's Forms, or Aquinas' God. The post-modern world view is internally oriented: forms, gods, goals emerge from interactions. Thus, the cosmology and teleology are "lesser" not "greater." A post-modern curriculum will combine the best of pre-modern thought with the best of modern thought, and will, like alchemies of old, transform both into a new substance, or process.

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